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MiniMaster

Manual
User manual
Инструкция



1. Product description

MiniMaster is an electronic unit for checking and controlling the pH and/or chlorine level in a pool.
The pH value is measured with a pH electrode and the chlorine level is measured with a free chlorine electrode.
MiniMaster can be linked with dosing equipment for acid/alkali (pH) and chlorine.
The package contains: 1 control unit, 2 4m PE hoses, prefilter and hose connections.
Electrode kit supplied separately: contains electrode(s), cleanser and for the pH model also buffer solution pH 7.3.

2. Technical data	MiniMaster pH/chlorine	MiniMaster chlorine	MiniMaster pH
Power consumption - excl. dosing equipment	4W	2W	2W
Power consumption - dosing equipment (max.)	2x100W	100W	100W
Rated current	1 A		
Voltage	220-240V 1~N 50/60Hz		
Temperature range	0 to +45°C		
Enclosure rating	IP44		
Measurements L x W x H	310 x 85 x 500 mm		
Weight	2 kg		

3. General info

MiniMaster measures and continuously indicates the pool water's pH reading and chlorine content.
Upon deviant readings, the control unit gives signals to external dosage equipment that applies doses.
To maintain balanced water quality, it is important to follow our recommended readings as per below.
pH readings outside the recommended readings will provide misleading chlorine readings at MiniMaster.
If the pool water was previously dosed with organic chlorine containing cyanuric acid (such as in tablet/puck form), this may cause an incorrect chlorine measurement (for action; see section 8 point 8).
We recommend use of a photometric test instrument for reference measurement and calibration.
MiniMaster must be mounted on a wall or similar and must sit straight. The installation space for MiniMaster is recommended to be indoor or under a roof, and to be easily accessible to be able to easily take readings, perform service, take water samples and clean the prefilter.

Recommended readings regarding water quality

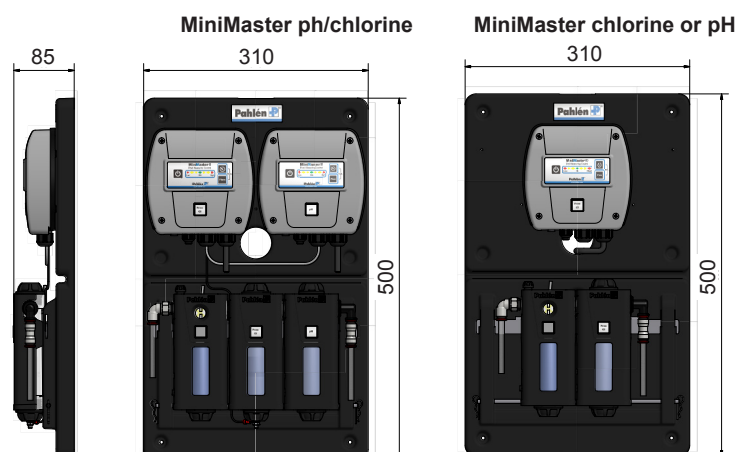
Chlorine content: 0.5-1.5 mg/l (ppm)
pH reading: 7.2-7.6
Alkalinity: 60-120 mg/l (ppm)
Chloride (salt) content: max 5000 mg/l (ppm) = 0.5%
Calcium hardness: 100-300 mg/l (ppm)
Cyanuric acid: max 5 mg/l (ppm)

For more details on pool chemistry and care, refer to the pool user's guide on our website <http://www.pahlen.com/users-guide/>

4. Safety

Dosage of chlorine, acid or the like shall be done AFTER all other equipment to minimise the corrosion risk.
Dose points in the circulation system for liquid acid and chlorine shall be as far apart as possible, although a minimum of 500 mm and **chlorine dosing shall always be placed last**, see picture 3

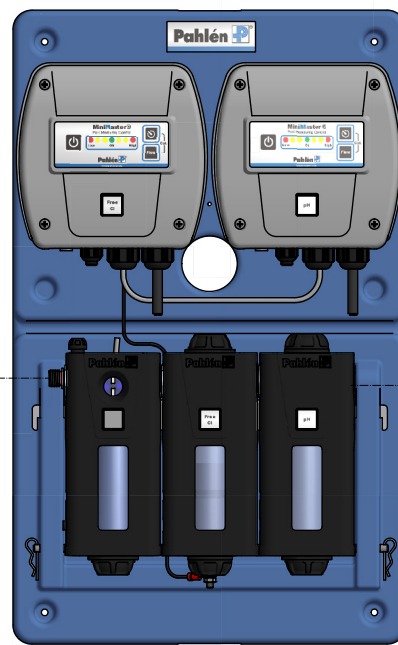
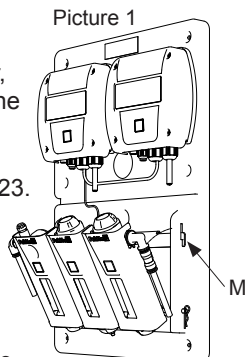
5. Dimensions



6. Installation

Tapping sleeves are recommended for installation of the pipe lines for the connection points of the measurement water to and from MiniMaster, and for the dosage points for liquid acid and chlorine via hose pumps. Hard PE hose is included that shall sit between MiniMaster, the prefilter and the pipe lines.

1. Install MiniMaster against a wall.
Install the included connections on MiniMaster, see picture 2. Disconnect the brace (M), fold the modules forward, screw the connections on MiniMaster's inlet and outlet.
 2. Assemble the prefilter, see instructions MA60-23.
NOTE: The top on the filter has an arrow marking the flow direction.
 3. Install the prefilter at a suitable location near the MiniMaster.
 4. Cut the included hose to suitable lengths and connect them without sharp bends between the MiniMaster and prefilter.
NOTE: When installing hose in hose couplings of an insert type: Make a straight cut with a sharp knife in the hose, push in the hose end approx. 10mm in the coupling, then pull the hose backwards for secure locking.
 5. Inlet A: Install a tapping sleeve after the sand filter on the pressure side of the pool circulation pump (see A picture 3).
 6. Outlet B: Install a tapping sleeve after the skimmer on the suction side of the pool circulation pump (see B picture 3).
 7. Cut the included hose to two suitable lengths, install hose coupling to the respective tapping sleeve.
Use threaded seal at the connection of bushing 1/4"-1/2" to the tapping sleeve/line pipe.
 8. Connect the one hose to the prefilter and to inlet A.
 9. Connect the other hose to the prefilter and to outlet B.
Alternative placement of outlet B: Guide the hose directly down in the skimmer (C, picture 3) or to an equalization tank.
 10. If dosage pumps are used for liquid chlorine and acid/alkali, the dosing points shall be placed a MINIMUM of 500 mm apart from each other, after other equipment for heating/other disinfection.
- Chlorine dosing is always placed last.**



Picture 2.

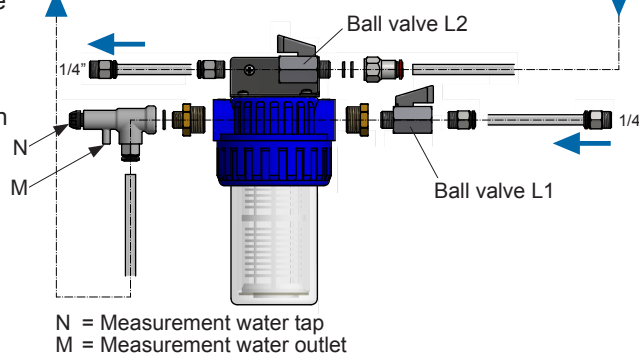
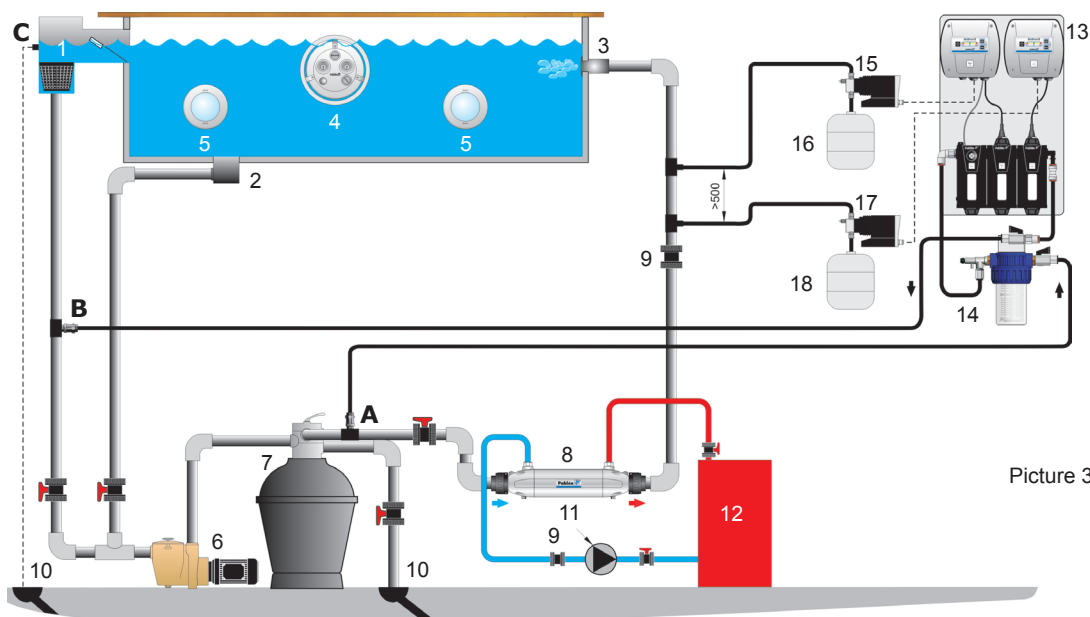


Fig. 4.

1. Skimmer
2. Main drain
3. Inlet
4. JetSwim
5. Light
6. Circulation pump pool
7. Filter
8. Heat exchanger
9. Check valve
10. Drain
11. Circulation pump heat
12. Boiler
13. MiniMaster
14. Prefilter MiniMaster
15. Chlorine dosing
16. Chlorine
17. Acid/alkali dosing
18. Acid/alkali



Picture 3

7. Installation, electrics

Electrical installation must always be carried out by a an authorized electrician.

Pipe installation must be complete before electrical installation is started.

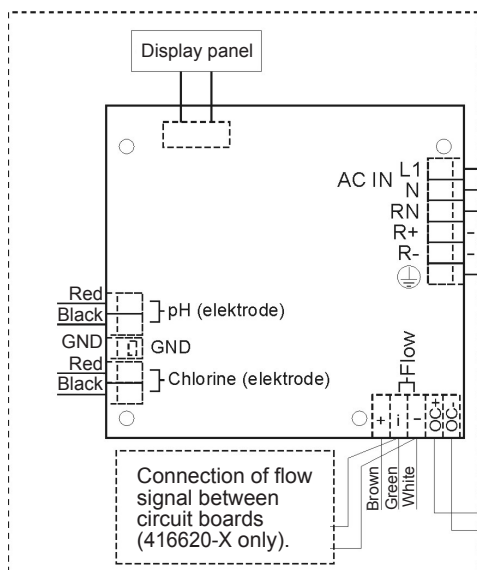
Pahlén recommends a fixed installation with a 2-pole working breaker.

Loosen the cover's four screws. The control unit cover can easily be hooked into open position to facilitate the installation work.

NOTE: Ensure that the band cable from the circuit board to the cover is not pinched.

Hook on the cover according to picture 5. Connect the power cable and any dosing equipment as indicated in the diagram below. The multi-pole contacts to the circuit board can be uninstalled for access to screw plinths for the respective cable connection.

Circuit board - control unit Chlorine and/or pH



AC IN

Main current connection to the unit.

Relay connection

Connection of dosing equipment, 230 VAC, NOT potential free. Max 1A

R+: Phase (for dosing chlorine and pH-elevating agent).

R-: Phase (for dosing pH-reducing agent).

RN: Zero/Neutral (common for dosing).

OC+/OC-:

Transistor "open collector" output for dosing equipment, max 5V.

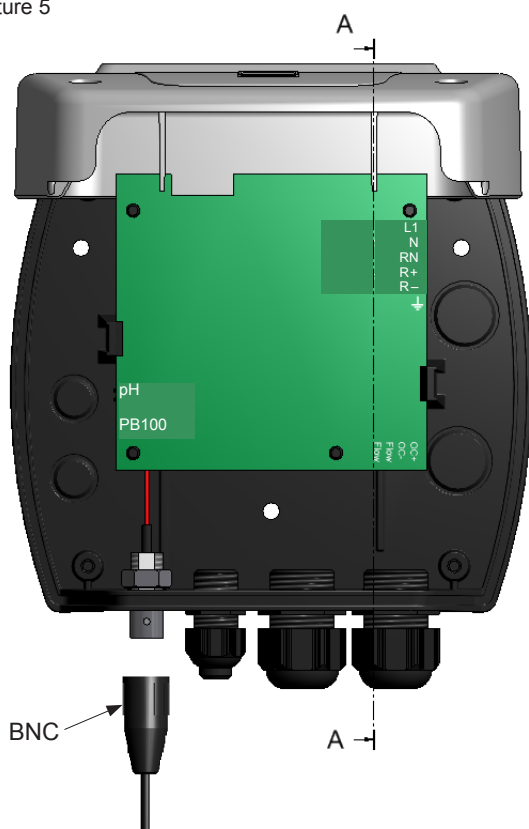
pH/Chlorine:

Connector for electrode connection.

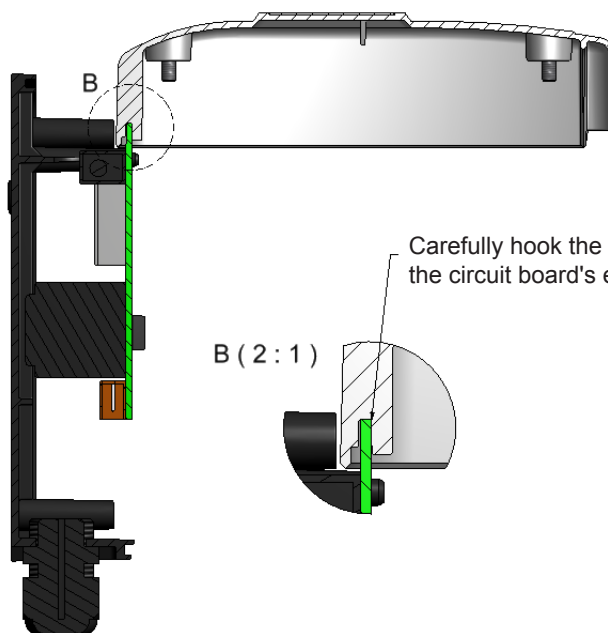
GND:

Ground socket connection (Chlorine measurement only).

Picture 5



A-A (1 : 1)



B (2 : 1)

Carefully hook the cover on the circuit board's edge.

8. Start

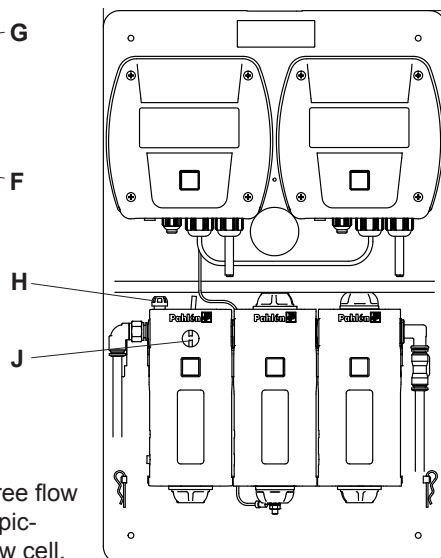
Preparation

1. Check that the pool's water readings are within recommended limits, use photometric measurement equipment.
2. Just before start, the electrodes are installed in the respective module. Then connect the electrode's BNC contact to the respective control unit, see picture 5. NOTE: The electrodes shall always be stored in liquid.

Picture 6



Picture 7



Start-up

First read through the paragraph on "LEDs" in section 10 Operation, which describes MiniMaster's LED signals and what they mean.

The pool circulation pump must be running in order for the unit to function.

1. Switch on MiniMaster.
2. Open all taps.
3. Press the Flow button (F).
(Only required on the left-hand unit when there are two).
4. Adjust the flow with the flow screw (H) until LEDs no. 1 to 4 are on.
Check that the unit has a flow, can be seen in the window (J), and that there is a free flow through the hoses. If the outlet hose is installed on the pump's suction side (alt. B picture 3), ball valve L2 (picture 2) shall be open 25-50% to avoid a vacuum in the flow cell.
5. Let the flow cell flow for at least 30 minutes for stabilization of electrodes and elimination of air in the flow cell.
6. Check the pool's pH reading.
7. Balance the pH, see below.

Balance pH

Take measurement water from the drain tap (N, picture 2) and check the pool's pH by using photometric measurement equipment.

Balance the pH to 7.2-7.4 by manually dosing with acid (upon high pH) or alkali (upon low pH) directly in the pool or with dosing equipment (accessory) for MiniMaster;

- press button (E) to activate the dosing function (LED is lit with a steady glow).
- press button (G) for 3 seconds for **forced dosing** for 30 seconds.
- then press button (E) to stop the dosing function (LED blinks).

Concentrated dosing can initially cause major fluctuations depending on pool size and turnover rate. Let the fluctuations level off and carefully check that the pH has stabilised after around 5 hours.

8. The water's pH must be balanced before going on to adjust the free chlorine reading, see below. Incorrect pH causes in-correct free chlorine readings.

Adjust free chlorine

Take measurement water from the drain tap on the prefilter (N, picture 2) and check the pool's free chlorine by using photometric measurement equipment.

Adjust the chlorine reading to 0.5-1.5mg/l by either dosing chlorine directly in the pool or with dosing equipment for MiniMaster;

- press button (E) to activate the dosing function (LED is lit with a steady glow).
- press button (G) for 3 seconds for **forced dosing** for 2 minutes
- then press (E) to stop the dosing function (LED blinks).

Concentrated dosing can initially cause major fluctuations depending on pool size and turnover rate. Let the fluctuations level off and carefully check that the chlorine content has stabilised after around 5 hours.

NOTE: If organic chlorine (weekly chlorine in puck form) is used or has been used in the pool, this causes cyanuric acid in the pool water.

Cyanuric acid in the water causes misleading free chlorine readings and calibration errors in MiniMaster. If so, dilute the pool water with so much new water that the cyanuric acid reaches the recommended value (see "Recommended values.." in section 3 General info).

9. When the values for both pH and free chlorine are in balance at the same time, one can continue and calibrate MiniMaster. Each unit is calibrated separately. They are independent of each other.

9. Calibration

The electrodes shall be cleaned, the flow cell shall have the right flow and the dosing mode shall be deactivated before calibration is done. Every unit is calibrated separately, they are independent of each other.

Calibrate pH

- Reference to calibrate against can either be the pool water (alt. 1) or buffer fluid (alt. 2). The pH value shall be between 7.2 and 7.4.
Alt. 1 pool water: Take measurement water from the drain tap on the prefilter (N) and check it with the photometric measurement instrument.
Alt. 2 buffer fluid: Switch off the measurement water to the flow cell. Disconnect brace (M) fold out the modules, disconnect the electrode's BNC contact (see picture5) from the control unit, unscrew the pH electrode from the module, put back the BNC contact. Pour reference liquid pH 7.3 in a measurement glass, so much so it covers at least 2cm of the pH electrode (tapped reference liquid may not be reused) and let the electrode stand in the liquid for at least 30 seconds.
- Calibrate the unit by pressing the two calibration buttons (F+G) at the same time and keep them pressed.
- The LED flashes quickly (approx. 5 times per second) to confirm that calibration is in progress.
The flashing slows down once calibration is complete. You can then release the buttons.
- The calibrated value is saved in the unit memory. The green LED in the middle turns on and now represents this value. Once the unit is calibrated, dosing is activated by pressing the On/Off button (E) on the control unit.
The LED for the current value is now lit with a steady glow.

Calibrate free chlorine

- If pH has been calibrated with buffer fluid, but the pool water has an entirely different pH, wait until MiniMaster has achieved pH 7.2-7.4 either through automatic or manual dosing of acid/alkali.
- Test measure free chlorine: Take measurement water from the drain tap (N) on the prefilter. Use photometric measurement equipment and check that the free chlorine lies within 0.5-1.5mg/l (ppm).
- Calibrate the unit by pressing the two calibration buttons (F+G) at the same time and keep them pressed. The LED flashes quickly (approx. 5 times per second) to confirm that calibration is in progress.
- The flashing slows down once calibration is complete. You can then release the buttons.
The calibrated value is saved in the unit memory. The green LED in the middle turns on and now represents this value.
- Once the unit is calibrated, dosing is activated by pressing the On/Off button (E) on the control unit.
The LED for the current value is now lit with a steady glow.

If calibration fails, it is often due to an implausible value (the previous value is then retained). The calibration then needs to be redone or see section 14 Trouble-shooting.

10. Operation

The measured value in the pool is indicated on the display with the seven LEDs.

A green LED shows MiniMaster's calibrated value (everything is OK) and is the unit's desired value. Yellow/red LED indicates a deviation from the calibrated value, see table below.

A blinking LED means that MiniMaster is measuring and a steady glow means measurement and an activated dosing mode, for more information see "LEDs" on the next page.

Upon a high pH: Relay output R- activated refers to acid dosing.
Upon a low pH: Relay output R+ activated refers to alkali dosing (see section 12 - Change of factory settings).
Upon a low free chlorine: Relay output R+ activated refers to chlorine dosing.

Picture 8



LED →	1. Red Low	2. Yellow	3. Yellow	4. Green Ok	5. Yellow	6. Yellow	7. Red High
pH	< 6.8	6.8-7.0	7.0-7.2	Calibration value (rec. 7.2-7.4)	7.4-7.6	7.6-7.8	>7.8
Free chlorine	< -80%	-60%	-30%	Calibration value (rec. 0.5-1.5 ppm)	+30%	+60%	>+80%
Flow L/h	<10	11-18	18-26	27-52	53-72	72-100	>100

LEDs

Type of LED signal	Meaning
The two red LEDs are lit with a steady glow:	The unit is not calibrated. Dosing is not possible.
The two red LEDs blink:	Flow too high or too low. Dosing is deactivated.
LED is lit with a steady glow:	Measurement ongoing, dosing mode is activated.
Blinking LED:	Measurement ongoing, dosing mode is not activated.
Rolling LEDs:	Forced dosing is in progress.

11. Buttons

E	On/Off - activates/deactivates the dosing function
F	Flow - pressed button shows the current flow through the MiniMaster flow cell.
F+G	Calibration
G	Forced dosing - pressed button for 3 seconds causes forced dosing for 2 minutes of chlorine or 30 seconds for pH (rolling LEDs). If an ongoing forced dosing needs to be discontinued early: press button (E).

12. Change of factory settings

Time-Out – exceeded dosing time

The time-out function is a built in safety catch in the software and is a limit on continuous dosing time.

The function is factory set and shuts off the dosing and triggers an alarm after 90 minutes of continuous dosing. This is to prevent unreasonable dosing, which can occur in the event of e.g. leakage or measurement error.

If the dosing equipment needs more than 90 minutes of dosing to achieve the correct values, the Time-Out function can be deactivated, see below.

When the power to MiniMaster is turned on, a start sequence is triggered after about 2 seconds and the LEDs (1-7) are lit in sequence, thereafter the set mode is shown (see point 5 below).

Deactivation of Time-Out (only the chlorine unit)

1. Switch off power to MiniMaster.
2. Switch on the power.
3. Press button E when LED 1 turns on, release when LED 2 turns on (respective LED blinks 2 times/second).
4. Press button E when LED 6 turns on, release when LED 7 turns on.
5. When the start sequence is done, the set mode is confirmed with a blinking indication:
– LED no. 3, 4 and 6 blink = deactivated Time-Out (– LED no. 3, 4 and 5 blink = activated Time-Out).
Save the setting by holding in button E for 3 seconds directly after finished confirmed LED indication (blinks 5 times) until LED 1 or 7 blinks rapidly.
6. To check which setting the unit has: turn off, wait approx. 3 sec., turn on power to the unit – LED 1 to 7 blinks during the start sequence with ensuing blinking indication as per point 5.
7. To activate the Time-Out function again, repeat from step 1.

NOTE: If Time-Out is deactivated an extended period of time and a fault arises, an unlimited amount of chemicals can be dosed into the pool or leak out in the machine room. Always check hoses, connections and chemical levels regularly and ensure that Time-Out is activated.

Dosing setting (acid or alkali)

Dosing function of pH-reducing agent (acid) is factory-set on the pH unit.

When the power to MiniMaster is turned on, a start sequence is triggered after about 2 seconds and the LEDs 1 to 7 are lit in sequence, thereafter the set mode is shown, see point 5 below.

If you instead want to dose alkali for a pH-increasing effect, a resetting must be done as per below:

NOTE: This only applies to the pH unit and pH calibration must be done before this change is begun.

Resetting to dosing of Alkali (only the pH unit)

1. Switch off power to MiniMaster.
2. Switch on the power.
3. Press button E when LED 1 turns on, release when LED 2 turns on (respective LED blinks 2 times/second).
4. Press button E when LED 6 turns on, release when LED 7 turns on.

5. When the start sequence is done, the set mode is confirmed with a blinking indication:
– LED no. **2, 4** and **5** blink = alkali dosing activated).
Save the setting by holding in button E for 2 seconds directly after finished confirmed LED indication until LED 1 and 7 blink rapidly.
6. To check which setting the unit has: turn off, wait approx. 3 sec., turn on power to the unit – LED 1 to 7 blinks during the start sequence with ensuing blinking indication as per point 5.
7. To change the dosing setting for acid, repeat from step 1. When the start sequence is done, the set mode is confirmed with a blinking indication:
– LED no. **2, 4** and **6** blink = acid dosing activated.

13. Care

- Upon back flushing of the pool's sand filter - first close the shut-off valves (L1 and L2) on the prefilter to and from MiniMaster.
- Check flow with pressed button (F) - adjust to the right flow with adjustment screw (H) on the start module.
- Reference measurement of chlorine and pH should be performed 1-2 times per month with digital photometric measurement equipment and with subsequent calibration. Take measurement water from measurement water outlet on the prefilter. Upon a deviation from calibrated value - clean the electrodes and calibrate afterwards.
- The plug threads and O-rings should be lubricated at least once per year with silicone grease with PTFE (non-petroleum-based grease).
- Check hoses, connections and chemical levels regularly.

Electrodes

Should be cleaned regularly (see instruction MA60-06: Electrodes, handling and care), at least once a month for a fresh water pool. For a salt water pool, contact ÅF for information on handling and care of MiniMaster in salt water.

1. Switch off dosing (on/off button E) - LED blinks.
2. Cut off the flow of water by closing the ball valves (L1 and L2).
3. Lift up the lock arm (M) and lower the modules forward, see picture 3.
4. Disconnect the electrode's BNC connector (see picture 5) from the control unit.
5. Unscrew the electrode and lift it upwards.
6. Clean and rinse off the electrode. Reinstall the electrode and BNC connector. Open the ball valves (L1 and L2).
7. Activate dosing (on/off button E) - LED is lit with a steady glow.

Filter

Check the filter regularly and clean as necessary. Replace the cartridge when necessary.

1. Switch off dosing (on/off button E) - LED blinks.
2. Cut off the flow of water by closing the ball valves (L1 and L2).
3. Unscrew the filter can where the cartridge sits.
4. Replace the filter or rinse it clean with regular water. A soft brush can be used if necessary.
5. Reinstall filter. Open the ball valves (L1 and L2).
6. Activate dosing (on/off button E) - LED is lit with a steady glow.

Adjustment screws

Adjustment screws (H) and Measurement water tap (N) are cleaned as necessary so they do not seize due to being coated.

1. Switch off dosing (on/off button E) - LED blinks.
2. Cut off the flow with the ball valves (L1 and L2).
3. Screw out the adjustment screw, rinse it and wipe it off.
4. Lubricate the O-ring and plug thread with a little silicone grease. Reinstall them. Open the ball valves (L1 and L2).
5. Activate dosing (on/off button E) - LED is lit with a steady glow.

Winter storage

Upon the risk of freezing, the modules and prefilter should be emptied from water, bottom plugs removed, electrodes uninstalled and stored frost-free in their delivery container filled with tap water.

Handling of chemicals



Liquid chlorine and liquid acid are strong chemicals with alkali and acidic properties. These MAY NOT be mixed with each other as this can cause strong chemical reactions. The different chemical containers shall be placed well separated from each other and stand in its own reclamation container. When handling these chemicals, protective equipment shall always be used, such as protective gloves, apron and protective glasses.

14. Operating information and troubleshooting

LED signals

Type of LED signal	Explanation
The two red LEDs are lit with a steady glow	The unit is not calibrated - dosing is not possible
The two red LEDs flash alternately	Flow too high or too low - dosing is deactivated
All red and yellow LED's blink simultaneously	Time-Out function: Continuous dosing has been under way more than 90 min - dosing is turned off. <ul style="list-style-type: none"> • Check dosing pump's function and setting. • Check that the chemical level is not too low in the drums. • Check leaks/function of dosing hoses, dosing points and dosing pumps. Restart: First turn off the dosing (On/Off button E), wait a few seconds, then start the dosing by pressing the On/Off button again (E).
LED is lit with a steady glow	Dosing is activated; measurement is in progress
Blinking LED	Dosing is NOT activated, but measurement is in progress
Rolling LEDs	Forced dosing is in progress.
Only applies to the chlorine unit:	
Blinking LED 3, 4, 5 after start sequence	Time-Out activated = dosing is blocked after 90 minutes of continuous dosing, (factory setting)
Blinking LED 3, 4, 6 after start sequence	Time-Out deactivated (unlimited continuous dosing)
Only applies to the pH unit:	
Blinking LED 2, 4, 5 after start sequence	Alkali dosing activated
Blinking LED 2, 4, 6 after start sequence	Acid dosing activated

Troubleshooting

Fault type	Action
The unit/dosing equipment does not start	<ul style="list-style-type: none"> • If the unit is interlocked over a turned off circulation pump, the unit will not start. • Check fuses on the circuit board.
Unstable/low flow in the flow cell	Check/clean prefilter. Clean and lubricate the adjustment screw on the flow cell.
Unit cannot be calibrated	<ul style="list-style-type: none"> • Low/high measurement water flow (only chlorine unit) - check filter. • Unreasonable measurement values; free chlorine < 0.3ppm or > 3.0ppm - check the chlorine values with photometric equipment. • High Cyanuric acid contents in the pool water - check with photometric equipment. Dilute the pool water with tap water as necessary. • Electrode or connection error - check connections, clean electrodes or replace them.
High and low values during operation - not stable calibrated value.	<ul style="list-style-type: none"> • Dosing set too high or low. Adjust dosing based on pool volume and turnover rate. • Check that the water flow is even through the flow cell. • Check electrodes' condition and connections.
Underpressure in return hose/flow cell	Press the Flow button (F, see picture 6), open Adjustment Screws (H, see picture 7) to max position. Then cut the flow with the ball valve L2 (see picture 2) carefully until LED 1 to 4 are lit.

Reservation

We reserve the right to correct any printing errors. We also reserve the right to make changes to technical specifications for MiniMaster or its manual without prior notice.

Colour deviations may occur due to technical reasons related to printing.